C3 gene

complement C3

Normal Function

The *C3* gene provides instructions for making a protein called complement component 3 (or C3). This protein plays a key role in a part of the body's immune response known as the complement system. The complement system is a group of proteins that work together to destroy foreign invaders (such as bacteria and viruses), trigger inflammation, and remove debris from cells and tissues.

The C3 protein is essential for turning on (activating) the complement system. The presence of foreign invaders triggers the C3 protein to be cut (cleaved) into two smaller pieces. One of these pieces, called C3b, interacts with several other proteins on the surface of cells to trigger the complement system's response. This process must be carefully regulated so the complement system targets only unwanted materials and does not damage the body's healthy cells.

Researchers have identified two major forms (allotypes) of the C3 protein, which are known as C3S and C3F. In the general population, C3S is more common than C3F. The two allotypes differ by a single protein building block (amino acid), although it is unclear whether they function differently.

Health Conditions Related to Genetic Changes

age-related macular degeneration

atypical hemolytic-uremic syndrome

C3 glomerulopathy

At least one mutation in the *C3* gene has been found to cause a rare form of kidney disease called C3 glomerulopathy. This disorder damages the kidneys and can lead to end-stage renal disease (ESRD), a life-threatening condition that prevents the kidneys from filtering fluids and waste products from the body effectively.

The identified *C3* gene mutation deletes two amino acids from the C3 protein. This genetic change is described as a "gain-of-function" mutation because it leads to an altered version of the protein that overactivates the complement system. The overactive system damages structures in the kidneys called glomeruli, which are clusters of tiny blood vessels that help filter waste products from the blood. Damage

to glomeruli prevents the kidneys from filtering waste products normally and can lead to ESRD.

Several other changes in the *C3* gene do not cause C3 glomerulopathy directly but appear to increase the likelihood of developing the disorder. In particular, the C3F allotype is seen more frequently in people with this condition than in the general population. Researchers are working to determine how the C3F allotype may influence disease risk.

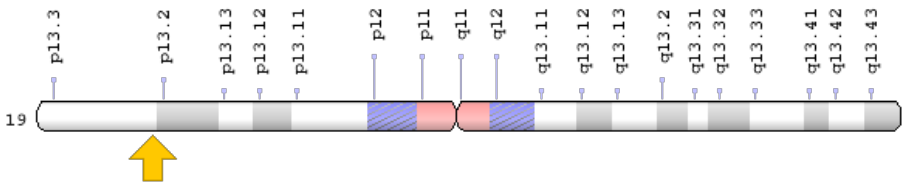
other disorders

At least 17 mutations in the *C3* gene have been found to cause C3 deficiency, a rare condition characterized by recurrent bacterial infections beginning in childhood. The genetic changes that cause C3 deficiency lead to an altered version of the C3 protein or prevent cells from producing any of this protein. These mutations are described as "loss-of-function" because the abnormal or missing C3 protein prevents normal activation of the complement system. As a result, the immune system is less able to protect the body against foreign invaders (such as bacteria).

Chromosomal Location

Cytogenetic Location: 19p13.3, which is the short (p) arm of chromosome 19 at position 13.3

Molecular Location: base pairs 6,677,835 to 6,720,682 on chromosome 19 (Homo sapiens Annotation Release 108, GRCh38.p7) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- acylation-stimulating protein cleavage product
- AHUS5
- ARMD9
- ASP
- C3 and PZP-like alpha-2-macroglobulin domain-containing protein 1

- C3a
- C3b
- CO3_HUMAN
- complement component 3
- CPAMD1

Additional Information & Resources

Educational Resources

- Immunobiology (fifth edition, 2001): The Complement System and Innate Immunity
  https://www.ncbi.nlm.nih.gov/books/NBK27100/

GeneReviews

- Dense Deposit Disease / Membranoproliferative Glomerulonephritis Type II
  https://www.ncbi.nlm.nih.gov/books/NBK1425
- Genetic Atypical Hemolytic-Uremic Syndrome
  https://www.ncbi.nlm.nih.gov/books/NBK1367

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28C3%5BTI%5D%29+OR+%28complement+component+3%5BTI%5D%29%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+720+days%22%5Bdp%5D

OMIM

- COMPLEMENT COMPONENT 3
  http://omim.org/entry/120700
- COMPLEMENT COMPONENT 3 DEFICIENCY, AUTOSOMAL RECESSIVE
  http://omim.org/entry/613779

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
  http://atlasgeneticsoncology.org/Genes/GC_C3.html
- C3base: Mutation Registry for C3 Deficiency
  http://structure.bmc.lu.se/idbase/C3base/index.php
- ClinVar
  https://www.ncbi.nlm.nih.gov/clinvar?term=C3%5Bgene%5D

- HGNC Gene Family: C3 and PZP like, alpha-2-macroglobulin domain containing
  http://www.genenames.org/cgi-bin/genefamilies/set/1234
- HGNC Gene Family: Complement system
  http://www.genenames.org/cgi-bin/genefamilies/set/492
- HGNC Gene Family: Endogenous ligands
  http://www.genenames.org/cgi-bin/genefamilies/set/542
- HGNC Gene Symbol Report
  http://www.genenames.org/cgi-bin/gene_symbol_report?q=data/hgnc_data.php&hgnc_id=1318
- NCBI Gene
  https://www.ncbi.nlm.nih.gov/gene/718
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  http://www.uniprot.org/uniprot/P01024

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